REMARKS

Claims 3, 6 and 13-15 are pending in the present application. By this Amendment, claims 3 and 13 have been amended. No new matter has been added. It is respectfully submitted that this Amendment is fully responsive to the Office Action dated July 13, 2005.

(1) Concerning the technical content of the invention

The invention relates to solid-state image pickup apparatus in which a solid-state image pickup device chip is packaged in CSP (chip size package), and relates more particularly to the hermetic seal portion thereof. Amended claim 3 will be first described below with making its technical content even more clear.

The frame portion of a hermetic seal portion of the solid state image pickup apparatus according to amended claim 3 at least includes: a metal wiring; a bump formed on solid-state image pickup device chip and electrically connected to the metal wiring; a frame base portion having the metal wiring formed on one surface thereof and adhered at the other surface thereof to a flat-plate portion; and a sealed region for sealing the periphery of the bump by a sealing material.

Further, the flat-plate portion is formed as having substantially the same size as the solid-state image pickup device chip and the frame portion is formed so that it does not jut out from the flat-plate portion to thereby construct a solid-state image

pickup apparatus in CSP form having substantially an equivalent size as the device chip where edge sides of the solid-state image pickup device chip and those of the hermetic seal portion are caused to substantially coincide. In other words, the edge sides of the flat-plate portion, frame portion and solid-state image pickup device are made substantially identical.

In this manner, the solid-state image pickup apparatus according to amended claim 3 is characterized in construction of the frame portion of the hermetic seal portion so that: a hermetic seal portion with an increased strength and high reliability can be obtained; a small-size packaging is feasible; an improved throughput is achieved; and an electrical connection with an external section is made easier.

The solid-state image pickup apparatus according to amended claim 13 has a hermetic seal portion comprising: a flat-plate portion formed of a transparent member; and a frame portion at least including a metal wiring disposed on a side portion of a lower surface of the flat-plate portion, a bump formed on solid-state image pickup device chip and electrically connected to the metal wiring, and a sealed region for sealing the periphery of the bump by a sealing material; wherein edge sides of the solid-state image pickup device chip and those of the hermetic seal portion are caused to substantially coincide, and a wiring region or an electrode pad region is formed from an electrode pad provided on the solid-state

image pickup device chip via the bump and metal wiring to a side surface or to a back surface through the side surface of the solid-state image pickup device chip so that an external terminal can be electrically connected to the wiring region or the electrode pad region.

With such construction, an optimal electrical connection structure to an external terminal is provided from the electrode pad of the solid-state image pickup device chip through the metal wiring formed on a side surface or the side surface and back surface of the solid-state image pickup device chip in a solid-state image pickup apparatus in CSP form having an equivalent size as the solid-state image pickup device chip. And it can be applied to various small-size packaging where, for example, a direct mounting of chip size solid-state image pickup apparatus onto a circuit board having a signal processing circuit, etc., formed thereon is made feasible.

The technical content of the fabricating method of solid-state image pickup apparatus according to amended claim 14 is as mentioned in page 8 and the bridging paragraph between pages 8 and 9 of the previous Amendment filed April 25, 2005. Although a description thereof is omitted here, it is possible with such fabricating method to readily fabricate a solid-state image pickup apparatus in CSP form where edge sides of solid-state image pickup device chip and those of hermetic seal portion substantially coincide.

Concerning cited references:

By contrast, newly cited Bauer (U.S.6,130,448) relates to the packaging of optical sensor and discloses an optical sensor package where a transparent window is sealed on an optical sensor attached to or mounted on a base substrate. Disclosures are made in Figs. 2 and 8 thereof with respect to construction as will be described below.

In particular, Fig. 2 discloses an enclosure assembly 20 for encapsulating an optical sensor 22. In the enclosure assembly 20, the optical sensor 22 is attached (die-bonded) to a surface of a base substrate 28 made of a nonconducting material, and a conductive strip 30 formed on the base substrate 28 and a pad of the optical sensor 22 are connected to each other by means of wire 32 to conduct signals and supply voltage between the optical sensor 22 and the base substrate 28. The base substrate 28 packaging the optical sensor 22 is further mounted on a support substrate 24. Further, the conductive strip 30 is connected to a corresponding trace 34 on the support substrate 24 through a conductive clip 36 and a solder joint 44. Furthermore, a transparent window 48 is adhered to the front side of the optical sensor 22 through a seal material 46 formed on the periphery of the optical sensor 22 so as to enclose the wire 32 (col. 4 line 52 — col. 5 line 42).

In other words, what is disclosed in Fig. 2 is an enclosure assembly (optical sensor package) where the optical sensor 22 is electrically connected to the corresponding trace 34 on the support substrate 24 through the wire 22 and the conductive strip 30 on the base substrate 28 and clip 36.

Fig. 8 discloses an optical sensor package using the flip chip technology. In the optical sensor package, an optical sensor 22 is linked through a solder bump 120 to a nontransparent base substrate 28 containing an opening hole 122 corresponding to a light receiving section and having a conductive strip 30 formed thereon. A transparent or nearly transparent window 126 is then bonded by means of a seal material 124 to an upper portion of the base substrate 28 in a manner surrounding the hole 22. Further, the conductive strip 30 formed on a lower surface of the base substrate 28 is pasted through a seal material 128 to a support substrate 24 having a corresponding trace 34 which corresponds to the conductive strip 30. Furthermore, an opaque cover 130 is adhered to the base substrate 28 through a seal material 128 on the back surface side of the optical sensor 22 (co1.10 line 61--co1.11 line 26).

In other words, the optical sensor package disclosed in Fig. 8 is a sort of COB (Chip on Board) packaging which is a type of flip chip packaging. The optical sensor 22 is mounted on the base substrate 28 having the conductive strip 30, and an electrical connection is provided between an electrode pad on the sensor and the conductive strip 30. A lower portion of the optical sensor 22 is then covered with cover 130 for protection, and the window 126 is adhered to the base substrate 28 by means of seal material 124 to irradiate light. Further, the conductive strip 30 on the base substrate 28 and the trace 34 formed on the support substrate 24 are connected to each other to provide connection with an external terminal.

Contrast between the invention of the present case and the cited reference:

Independent Claim 3:

In respect of claim 3, the Examiner has cited specifically Fig. 8 of Bauer to conclude that claim 3 is rejected under 35 U.S.C. 102(e) as being anticipated by Bauer. This rejection is respectfully traversed.

However, while the optical sensor disclosed in Fig. 8 of Bauer uses flip chip packaging, the solid-state image pickup apparatus according to amended claim 3 of the present case relates to CSP (chip size package) which is a small-size packaging for achieving the size substantially equivalent to chip.

In particular, the solid-state image pickup apparatus according to amended claim 3 of the present case relates to CSP, and the hermetic seal portion thereof is constructed of the flat-plate portion on the solid-state image pickup device chip, and the frame portion having the frame base portion, metal wiring, bump, and sealant that are formed on a side portion of a lower surface of the flat-plate portion. The flat-plate portion has substantially the same size as the solid-state image pickup device chip, and construction is such that edge sides of the flat-plate portion and the frame portion, i.e., of the hermetic seal portion and the solid-state image pickup device chip substantially coincide. A small-size packaging is thereby made feasible.

On the other hand, the optical sensor package disclosed in Fig. 8 of Bauer is a sort of COB (Chip on Board) packaging which is a type of flip chip packaging as described above. It is constructed of: optical sensor 22; base substrate 28 having conductive strip 30; solder bump 120 for connecting between optical sensor 22 and conductive strip 30; window 126 and cover 130 on the front surface side and back surface side of the optical sensor 22; support substrate 24; and seal material 124, 128 for adhering window 126 and cover 130 to the base substrate 28.

The base substrate 28 and support substrate 24 in this case are a substrate for mounting the optical sensor 22 and a substrate for moreover mounting the base substrate 28 on which the optical sensor 22 is mounted, respectively, and clearly do not correspond to the frame portion or frame base portion of the hermetic seal portion in claim 3 of the present case.

Further, the seal material 124 is for adhering window 126 onto an upper side of the base substrate 28 on which the optical sensor 22 is mounted and is different from the sealing material for sealing the periphery of the bump which is one of the constructional requirements of the frame portion of the hermetic seal portion in claim 3 of the present case.

Furthermore, while there is no disclosure in Bauer as to the size of the optical sensor package, it is impossible from Fig.8 to say that the base substrate 28, window 126, cover 130 of the optical sensor package are of an equivalent size as the optical sensor 22.

Accordingly, it is clear that the optical sensor package of Bauer is not of CSP structure where, like amended claim 3 of the present case, the hermetic seal portion is constructed of a flat-plate portion and a frame portion formed on a side portion of a lower surface of the flat-plate portion, and edge sides of the solid-state image pickup device chip and of the hermetic seal portion substantially coincide.

As the above, the solid-state image pickup apparatus according to amended claim 3 of the present case and the one disclosed in Bauer are totally different from each other in packaging form and in construction of the hermetic seal portion. Bauer does neither disclose nor suggest the technical content of amended claim 3 of the present case.

Independent Claim 13:

In respect of claim 13, the Examiner has specifically cited Fig. 2 of Bauer to conclude that claim 13 is rejected under U.S.C. 102(e) as being anticipated by Bauer. This rejection is respectfully traversed.

The enclosure assembly 20 disclosed in Fig. 2 of Bauer, however, is fundamentally similar to the most generally used packaging form, i.e., what is shown as prior art in Fig. 1 of the application of the present case where a device chip is mounted onto a normal package such as of ceramic with using wire bonding.

Particularly in the enclosure assembly 20 disclosed in Fig. 2 of Bauer, after connecting between an electrode pad of the optical sensor 22 and the base substrate 28 with wire bonding, such as conductive clip 36 for providing conduction between the conductive strip 30 on the front surface of the base substrate 28 and the back surface of the base substrate 28 is provided at an end of base substrate 28 to form a wiring region extended from the front surface to the back surface of the base substrate 28. An opposing section 40 of the clip 36 is then connected to the corresponding trace 34 on the support substrate 24 by means of solder joint 44.

In other words, wiring region is not formed on the edge sides of the optical sensor chip itself in the one disclosed in Fig. 2 of Bauer. Rather, a wiring region is formed with using the conductive clip 36 from the front surface to the back surface of the base substrate 28 which packages the optical sensor chip 22 with wire bonding 32 so that an external terminal can be electrically connected to the wiring region. Accordingly, the one disclosed in Fig. 2 of Bauer is not to achieve a packaging form where it is kept to chip size.

The solid-state image pickup apparatus according to amended claim 13 of the present case, on the other hand, relates to CSP. Specifically, as shown in Fig. 9, wiring region 13 is formed from bump 6 on sensor chip 1 to a side surface of the chip 1 through metal wiring 7 or to the back surface of the chip 1 so that an external terminal can be electrically connected to the wiring region 13.

In this manner, of the solid-state image pickup apparatus according to amended claim 13 of the present case, the wiring region is formed to a side surface or through the side surface to the back surface of the sensor chip itself to achieve a small-size packaging kept to chip size where edge sides of the solid-state image pickup device chip and of the hermetic seal portion substantially coincide. It is totally different in construction from the one disclosed in Bauer which does not purport to be a packaging form kept to chip size as described. Bauer does neither mention nor suggest at all the above described construction which features amended claim 13 of the present case.

Dependent Claims 6 and 15:

In respect of claims 6 and 15, the Examiner has mentioned that claims 6 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bauer. This rejection is respectfully traversed.

Claims 6 and 15 are the claims that depend on claims 3 and 13, respectively. Since the solid-state image pickup apparatus according to claims 3 and 13 are different from those disclosed in Bauer as described and are fully patentable, claims 6 and 15 made as their dependent claims are thought to be also fully patentable.

Independent claim 14:

In respect of claim 14, the Examiner has concluded that claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bauer, in view of Iizima (U.S. 6,483,179). This rejection is respectfully traversed.

With regard to clam 14, the Examiner correctly acknowledges that "[t]his rejection might be overcome by showing that the reference is disqualified under 35 USC 103(c) as prior art in a rejection under 35 USC 103(a)."[1]

That is, it is respectfully submitted that the present application has a filing date that falls after November 29, 1999 and that at the time the claimed invention was made the Iizima reference was assigned to Olympus Optical Co., Ltd., which is the same assignee of the present application.

Therefore, it is submitted that the Iizima reference is disqualified under 35 USC 103(c) as a prior art reference in the rejection of claim 14 under 35 USC 103(a).

In other words, the rejection of claim 14 under 35 USC 103(a) is improper since Iizima fails to quality as prior art under 35 USC 103(c).

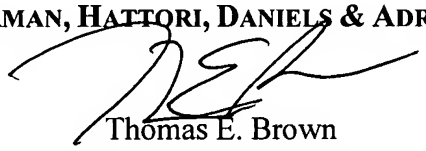
In view of the aforementioned amendments and accompanying remarks, Applicants submit that that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP



Thomas E. Brown
Attorney for Applicants
Registration No. 44,450
Telephone: (202) 822-1100
Facsimile: (202) 822-1111

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[1] Please see, lines 18-20, page 5 of the Action.